Forest Service

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File Code: 3420 **Date:** January 9, 2012
Route To:

Subject: Aerial Application of MCH Flakes and Ground Deployment of MCH Bubble Caps on Bald Mountain Ski Area in 2011

To: Forest Supervisor, Sawtooth NF

Enclosed is Forest Health Protection (FHP) Project Report, BFO-PR-2012-01detailing the 2011 aerial application of Methylcyclohexanone (MCH) flakes, ground deployment of MCH bubble caps on Bald Mountain Ski Area, and monitoring efforts to report treatment efficacy. Since Douglas-fir beetle populations have declined to low levels and no longer pose a threat to this ski area, we recommend no MCH treatment in 2012. We do, however, recommend silvicultural treatment to improve tree vigor and resistance to any future Douglas-fir beetle activity.

If you have any questions, please contact Laura Lazarus at 208-373-4226 in the Forest Health Protection Boise Field Office. For more general information on Forest Health Protection programs and services, visit our combined Region 1 and 4 Web site at: http://www.fs.usda.gov/goto/r14-FHPmain .

/s/ Dayle D. Bennett (for)
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Director, State and Private Forestry

Enclosure

cc: Dayle D Bennett
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FOREST HEALTH PROTECTION
USDA Forest Service
State and Private Forestry

BFO-PR-12-01
January 10, 2012

Aerial Application of MCH Flakes and Ground Deployment of MCH Bubble Caps to Reduce Impacts from Douglas-fir Beetle on Bald Mountain Ski Area in 2011

Ketchum Ranger District

Sawtooth National Forest

By

Laura Lazarus, Forest Entomologist
Region 4, S&PF, Forest Health Protection, Boise Field Office

ABSTRACT
Populations of Douglas-fir beetle (DFB) began to build in 2009 on Bald Mountain Ski Area (BMSA) in response to the 2007 Castle Rock fire. The 2011 treatment strategy developed using a combination of an aerial application of the anti-aggregant, Methylcyclohexanone (MCH), and a ground deployment of MCH bubble caps to (1) protect stands of susceptible Douglas-fir (DF) on the BMSA from undesirable attack and mortality caused by DFB, and (2) to safely and effectively implement the proposed treatments. Monitoring efforts in September found that DFB's attacked 0.03 trees per acre (TPA) in treated areas, and 0.95 TPA in untreated areas. Trap catches were higher in 2011 than in 2010, but nonetheless, DFB attacks were unsuccessful throughout BMSA. Lessons learned include 1) difficulties in monitoring the dosage of brown flakes in the field post application because of ground camouflage, and 2) that healthy DF successfully defended attack or were not attractive to DFB's. Treatment in 2012 is not recommended because DFB population levels have declined on BMSA. Although risk of attack is low for 2012, stand conditions within BMSA still remain highly susceptible to DFB. Stand densities should be reduced throughout BMSA to increase tree vigor and reduce the potential for DFB attack in the future.

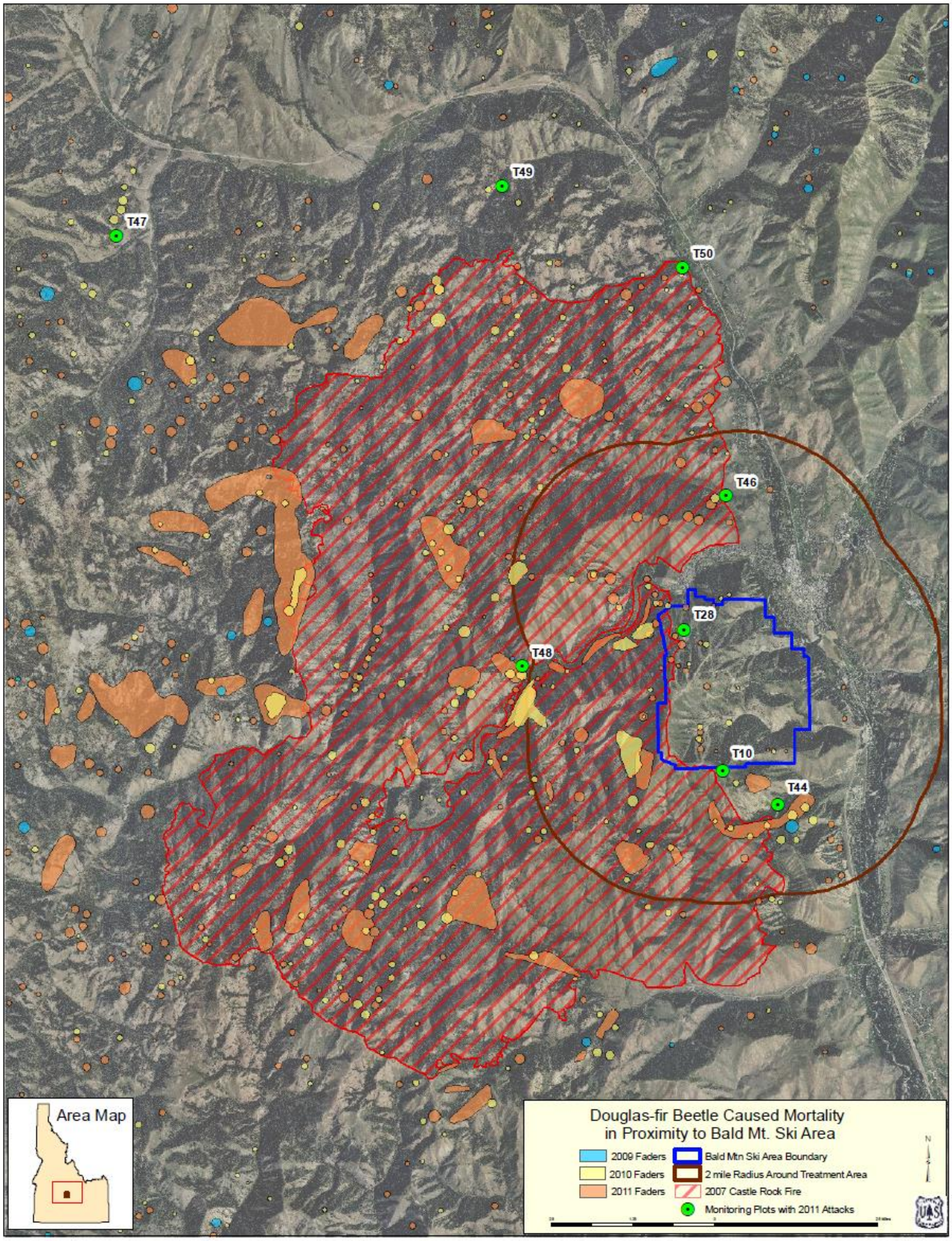
INTRODUCTION
The 2007 Castle Rock fire burned approximately 48,000 acres of Sawtooth National Forest and Twin Falls District, Bureau of Land Management (BLM) public lands, including the southern and western edges of the BMSA (Figure 1). Following that fire, the population of DFB increased in standing, fire-scorched and green DF, in and adjacent to the ski area (Lazarus and Hoffman 2009, Lazarus 2009, and Lazarus and Bennett 2010). Predicted tree mortality from these increasing DFB populations threatened Forest Service management objectives for the area. These objectives include: visual quality, snow protection, wildlife habitat, wind-scour protection, and ski run delineation on BMSA.

We considered the DFB population trends, stand hazard ratings, and 2010 Aerial Detection Survey (ADS) while planning for 2011 treatments. The 2010 ADS showed more areas attacked by DFB in 2009 than in 2008. Ground sampling indicated that areas attacked by DFB increased in 2010 in both the burned and unburned areas, and 2010 attacks were found in all burned areas sampled from the ground (Lazarus and Bennett 2010). It was rare to find 2008 attacks in sampled areas; however, 2009 and 2010 attacks were found in treated and untreated areas. This indicated the DFB outbreak would continue to cause additional mortality in the contiguous and highly susceptible stands of DF on BMSA in 2011 (Lazarus and Bennett 2010).

Stands monitored with variable radius plots in 2009-2010 were all rated highly susceptible to DFB as were most other stands visually inspected throughout the majority of the ski area using two rating systems, Stand Hazard Rating for Central Idaho Forests (Steele et.al 1996) and FINDITS (Bentz 2000). Stands with the following criteria were rated as highly susceptible stands: over 120 years of age, over 240 BA, over 50 percent of BA in DF, over 14 inches diameter at breast height (d.b.h.).

Because of the expanding DFB population that now threatened a larger, and difficult to access portion of the ski area, we recommended an aerial application of MCH flakes again in 2011 for susceptible stands (Lazarus and Bennett 2010). One precisely-timed aerial application of Disrupt Micro-Flake MCH bark beetle anti-aggregant flakes were applied to 1500 acres of BMSA on June 10, 2011. Other high priority areas consisting of very large diameter trees, or existing DFB infestations were treated using MCH bubble caps at a rate of 40/acre to ensure coverage (Figure 2).

Figure 1. Douglas-fir beetle-caused mortality in proximity to BMSA, Ketchum RD, Sawtooth NF, Idaho as determined by insect and disease aerial detection surveys.



The primary objectives of this project were to (1) protect stands of susceptible DF on the BMSA from undesirable attack and mortality caused by DFB; and (2) to safely, effectively and efficiently implement the proposed treatments. To assess project results: ground plots were established to monitor treatment effectiveness; baited traps were deployed to monitor DFB populations and flight behaviors to effectively time treatments; treated and non-treated areas, including riparian areas, were monitored for flake distribution and drift; and, MCH flake elution rates were evaluated for effectiveness.

TREATMENT DESCRIPTION

DISRUPT MICRO-FLAKE® MCH Bark Beetle Anti-Aggregant Flakes, made by Hercon Envrionmental, are three-ply plastic flakes laminated with Methylcyclohexenone (MCH) bark beetle anti-aggregant. These 6mm x 6mm flakes were applied by Columbia Basin Helicopters, Inc., using a Bell UHIH+ helicopter equipped with a SatLock DGPS swath guidance system, including moving maps and light bars. Contract stipulations limited application to periods when wind speed was no greater than 6 mph and periodic gusts no greater than 10 mph. These restrictions were to enhance the deployment of flakes at a uniform altitude and speed wherever possible. Flakes were released at about 100 feet above tree canopy. Once calibrated and characterized, the MCH flake delivery system was capable of displaying flow rate, deployment speed, swath width, and discharge at the appropriate rate during the application.

The applied flake rate was 1.2 kg/acre (2.6 lbs/acre), equalling 150 grams of active ingredient (A.I.)/acre over the 1,500 acres of treatment. The treatment dosage is half that of the recommended label dosage of 300 A.I. The dosage used in this operational project was based on the published field trials where the largest dose tested was 189 g A.I. that resulted in less than 1 percent of basal area (BA) attacked (Gillette et. al 2009, Gillette and Mehmel 2009). This attack rate was deemed acceptable to land managers, and since no field trial has been conducted with the 300 g. A.I. dosage the lower rate of 150 g was used to treat the maximum amount of acres possible with reasonable levels of protection from new DFB attacks. The aviation contract cost $52.00 per acre and the flake product cost $72.00 per acre.

TREATMENT EFFICACY EVALUATIONS USING VARIABLE RADIUS S AND ONE ACRE STRIP MONITORING PLOTS.

Objective and Methods

Pre-selected Areas, Treated vs. Untreated. The primary objective of this monitoring effort was to determine if the 2011 MCH flake treatments successfully reduced DF mortality to susceptible stands on BMSA. A secondary objective was to estimate the DFB population level and trend in BSMA to aid in treatment recommendations for 2012.

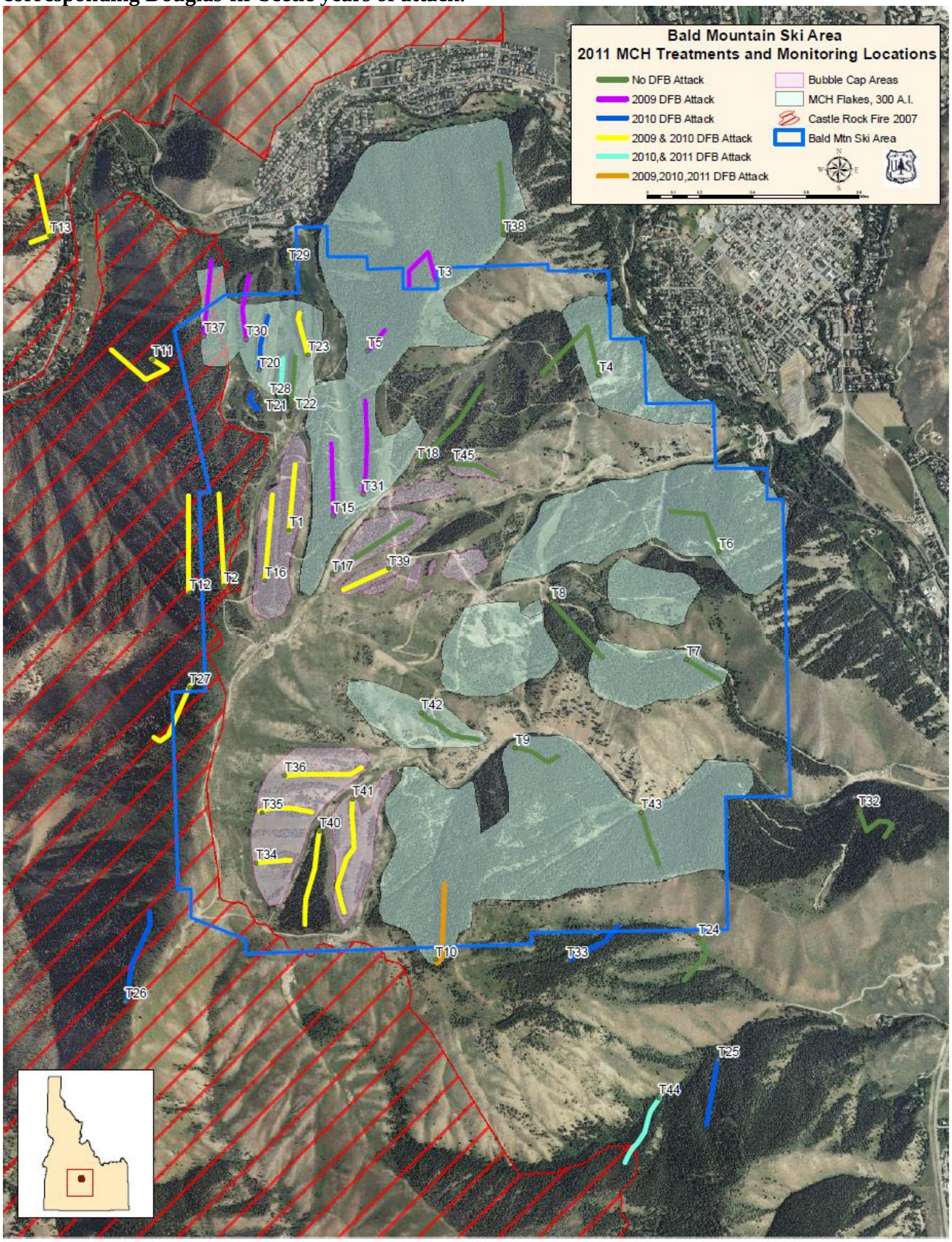
Using ArcMap (V.9.2) and geospatial data, we subdivided the project area into sample areas based upon stands of similar density and host type in previously infested and uninfested areas within the ski boundary. A smaller number of transects was established in similar stands outside and adjacent to the ski boundary to provide an area comparison. Transects were revisited from 2010 and seven plots were added to sample additional areas in 2011. Locations of plot transects were pre-selected (Figure 2).

Revisited transects were assessed using a 1- acre strip cruise plot, 66 ft wide by 660 ft long. All DF within the plots were evaluated for evidence of 2011 DFB attacks. Data recorded within the 1-acre strip cruise included: number of 2011 attacks, diameter at breast height (dbh) of each DFB-attacked tree, and presence/absence of brown MCH flakes.

The 2010 protocols (Lazarus and Bennett 2010) were followed for any new transects where each transect was a series of ten variable radius plots spaced at least three chains apart. Basal area factor 20 was used to determine sample trees. Transects were placed linearly downhill or contoured along the hillside as

long as suitable host was present (Figure 2). Plots were established September 12-16, 2011. Variables recorded were tree species; tree diameter at breast height (d.b.h.) (inches); tree condition (live/dead); evidence of DFB infestation; and, the type and year of DFB attack for all plot trees over 5 inches d.b.h.

Figure 2. Location of monitoring plots for the Bald Mountain Ski Area 2011 MCH Treatments, showing corresponding Douglas-fir beetle years of attack.



Data collected in surveyed DF stands was summarized using the Forest Insect and Disease Tally (FINDIT) program (Bentz 2000). The FINDIT program calculates the following statistics to determine the level of DFB-caused mortality and other stand attributes: total trees/acre (TPA); quadratic mean diameter (QMD); number of dead and live trees/acre; percentage of basal area (BA) comprised of each tree species; percentage of basal area killed by insects and diseases.

Attack Rates in Surrounding Areas. Five untreated areas were chosen to sample using the FINDITS methods described above specifically because they were attacked prior to 2011. Red fading trees were located from roads or trails and plot one of ten began in a red-needled (fader), DFB-killed area.

Results and Discussion

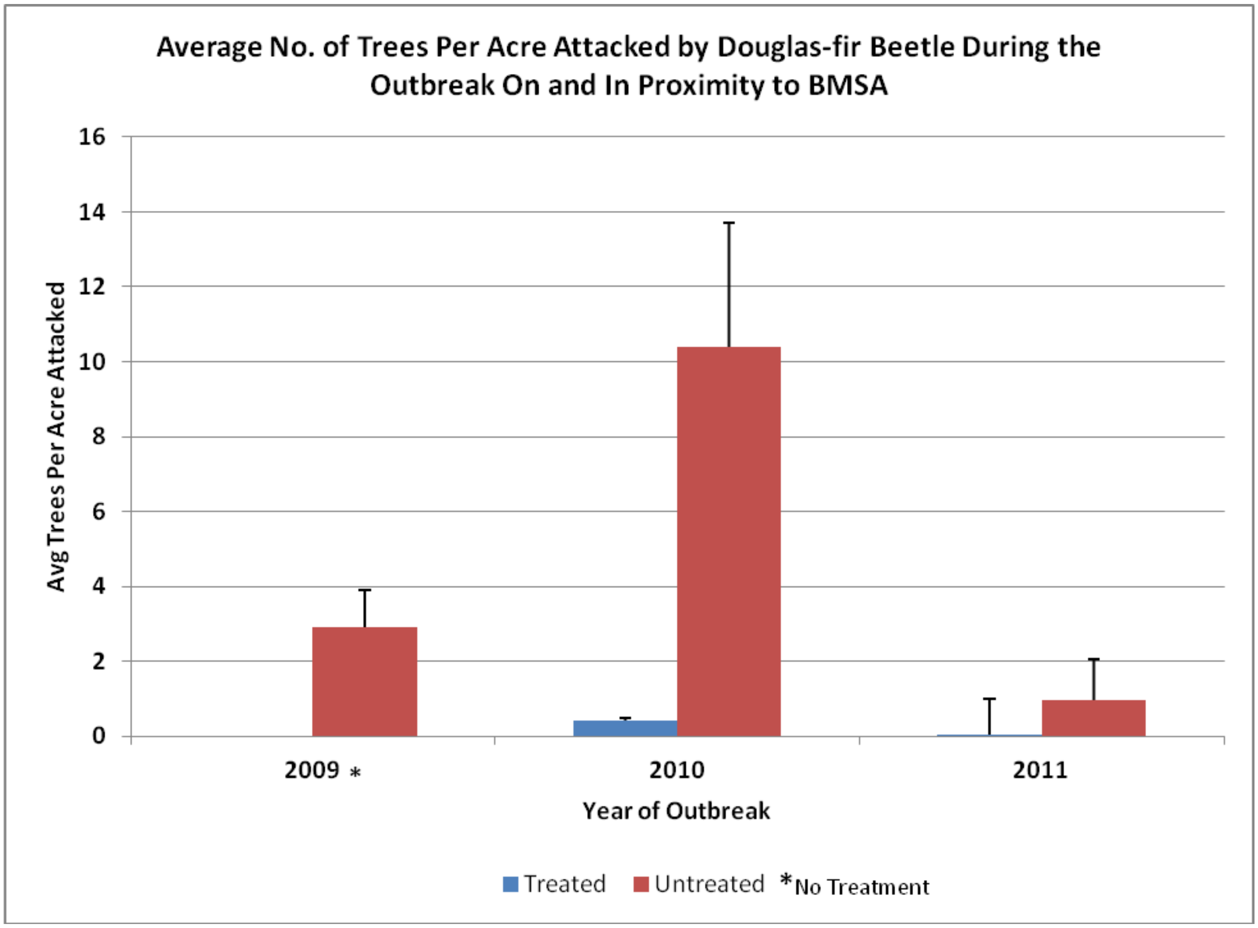
The objective of this monitoring effort and analysis was to report the overall effectiveness of the 2011 aerial flake and ground bubble cap applications. To that end, data gathered were considered sufficient because the plots were broadly representative of stand variations found throughout the treatment area. ADS surveys denoted faded trees in 2010 (shown in orange) within and adjacent to BMSA that indicated additional DFB pressure (Figure 1). These DFB populations were within the 2-mile buffer around BMSA (Figure 1) and could potentially disperse to attack DF on BMSA.

Pre-selected Areas, Treated vs. Untreated. In total, 43 pre-selected areas were monitored in 2011 (Figure 2, Appendix A): 34 were treated areas and 9 were untreated areas. By 2010, DFB attacks were found in all burned areas. It was rare to find 2008 attacks in sampled areas; however, 2009 and 2010 attacks were found in treated and untreated areas. In 2011, only three pre-selected monitoring transects had DFB attack, one in untreated areas and two in treated areas. Very few trees were attacked by DFB in 2011. Only two trees were attacked in all treated areas sampled in 2011, while 8.5 trees were attacked in all of the untreated acres sampled. No 2011 attacks were found in nine sampled areas treated with MCH bubblecaps.

After monitoring the outbreak area in September 2011 it became obvious that DFB attacks quickly built up in 2009 following the fall 2007 wildfire, peaked in 2010, and dropped off by 2011 (Figure 3). Before treatments in 2009, DFB attacked 2.9 TPA (Figure 3). In 2010, following treatment, DFB attacked an average of 10.4 TPA in the untreated areas compared to an average of 0.4 TPA in the treated areas (Figure 3). In 2011, DFB attacked an average of 0.95 TPA in the untreated compared to an average of 0.03 TPA in the treated areas (Figure 3, Appendix A). The comparisons between treated and untreated acres suggest that treatments did reduce attacks from DFB in 2010. However, 2011 DFB attacks were uncommon in treated and untreated areas leaving the efficacy of our treatments inconclusive for this year. DFB killed 23.6 percent of DF over 17 inches DBH on average, ranging from 0 to 56.3 percent. Preferred DF host (trees over 16 inches DBH) remains in all sampled stands, as well as suitable host (trees over 11 inches DBH) (Appedix A).

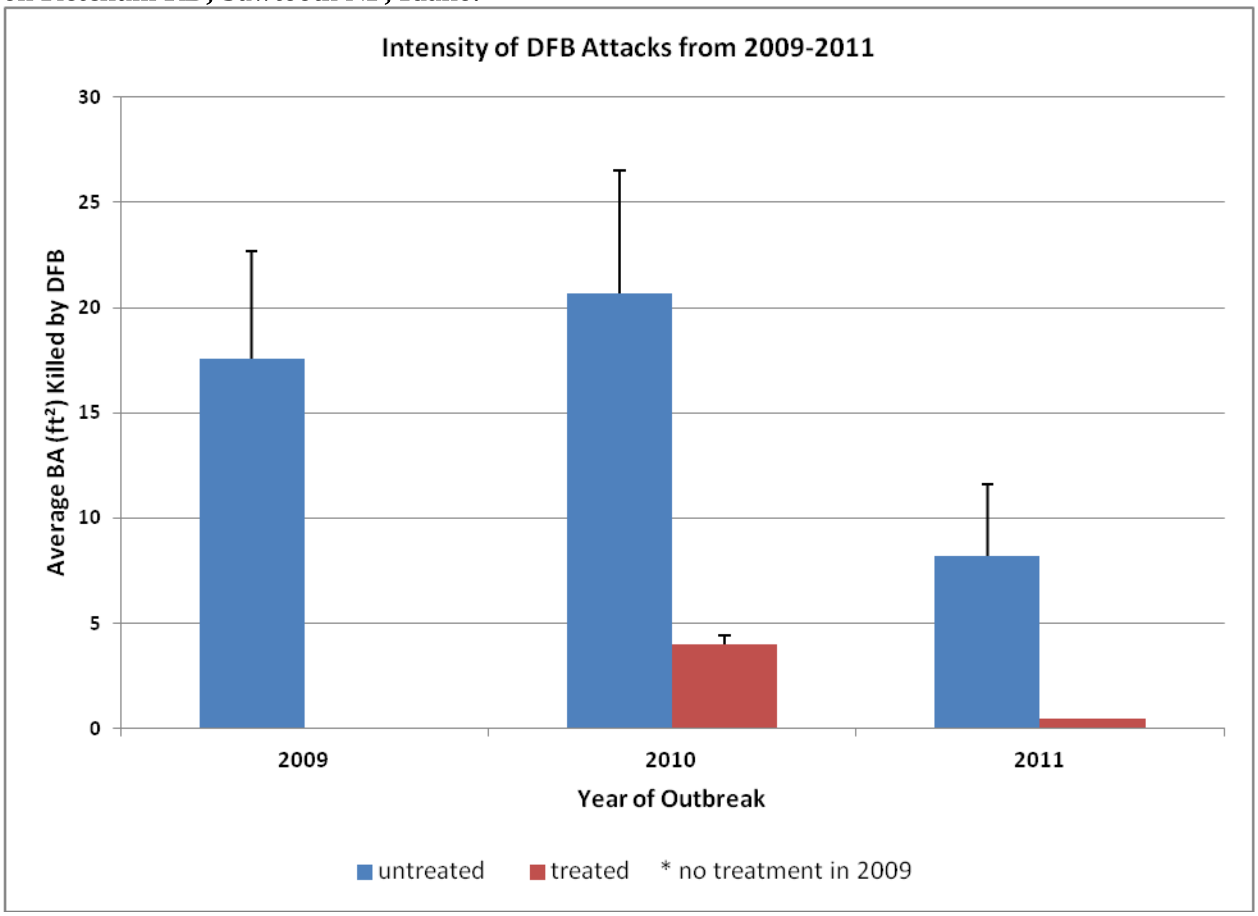
Heavy pitch streams were common on DF throughout all treated and untreated acres on many aspects, in far more frequency than any other year observed. Pitch streams predominantly began in the upper to middle bole and it was common to observe several pitch streams per tree. Pitch streams do not always indicate beetle attack, as several factors cause DF to stream pitch including wind strain. DFB frass was found mixed with the streaming pitch on a few occasions; however, attacks were unsuccessful in almost all cases.

Figure 3. Average trees per acre attacked by DFB for pre-selected treated and untreated sampled areas during 2011 Bald Mountain Ski Area aerial application of MCH flakes.



Attack Rates in Surrounding Areas. After evaluating the pre-selected treated and untreated sample areas, we realized that the DFB's were not successfully attacking DF. However, the ADS flight conducted in August showed many red, fading pockets of DF in more than five drainages surrounding our treatment area (Figure 1), thus, presenting a need to further evaluate DFB populations in proximity to the BSMA treatment. Five locations attacked by DFB were sampled and the general trend was that DFB population is on the decline. All five locations were attacked in 2009, 2010, and 2011. DFB's attacked 26.9, 8.8, 6.3 TPA, on average, in 2009, 2010, and 2011, respectively (Appendix B). Two of these areas were outside of the 2007 fire. DFB attacks markedly increased from 7.5 to 14.3 TPA in 2011 in transect 47, an area with a southerly aspect currently experiencing heavy western spruce budworm defoliation of over 90 percent (Figure 1). The other unburned area, transect 49, was comprised of very large diameter DF with heavy dwarf mistletoe infections (Figure 1, Appendix B). The trees in both these areas were stressed and DFB were able to successfully colonize them. However, many green trees in the areas visited outside the general treatment area streamed pitch down their boles. The percent of total DF BA attacked between 2009 and 2011 ranged from 4 and 49 percent (Figure 4). Negron et al.1999, estimated 62 percent of DF BA was killed by DFB in similar stands in central Idaho.

Figure 4. Areas attacked by DFB were considered for comparison over the course of the outbreak on Ketchum RD, Sawtooth NF, Idaho.



MONITORING DFB FLIGHT

Objective and Methods. The main objective of trapping DFB was to determine when flight begins and ends at various elevations; to time emergence and peak flight periods of DFB at BMSA; and, to determine application timing of treatments. A second objective was to record temperature effects on DFB flight over the season. Trap locations were selected based on proximity to DFB-infested areas included in the MCH treatment. However, trap locations were only placed on the ski runs or along roads, areas that were not directly included in the MCH flake treatment. Figure 5 shows the location of seven trap sets placed on the west side of BMSA, along Warm Springs Road, and Clear Creek Road. Traps were placed out May 16, 2011, where possible and otherwise as the ground thawed enough to secure the trap poles. DFB flight was monitored from May 24 to September 26, 2011, along an elevation gradient of 5,500 to 9,200 feet adjacent to the treatment area (Figure 5).

Each trap location was composed of a set of three Lindgren funnel traps spaced at least 30 feet apart along a transect easily accessible to the road and at least 100 feet from the nearest live host tree to avoid spillover effects. Panel and funnel traps were provided by FHP. Each trap was baited with a two-piece DFB Seudenol lure set (Synergy, Inc.), and a collection cup containing one, 1-inch^2, no-pest-strip.

Trap catches were collected weekly by Ketchum Ranger District personnel. Baits and no pest strips were replaced mid-July. All collected beetles were emptied into Ziplock freezer bags and labeled with the date, location, and trap number. Trap catches were sorted in the office. Sorted beetles were counted individually if there were not many per sample. When trap catches increased in late-June, beetle counts were measured volumetrically from each sample and an estimated "count" was recorded.

A Hobo weather station was provided by FHP and placed at the base of BMSA May 18 to September 26, 2011. A permanent weather station provided the information for the summit (Figure 5). Temperature data were recorded for subsequent use in determining temperature correlation with DFB catch data. Results of flight periodicity and temperature data may be used for future treatment timing.

Results and Discussion. DFBs fly when temperatures reach about 62 degrees Fahrenheit (Atkins and McMullen 1960). We began checking for DFB catches in the lowest elevation site traps along Warm Springs Road the week of May 23, 2011. We did not begin to check traps on BMSA summit area until June 20 because access was a problem and summit temperatures were lower than 60 degrees F. Weekly high averages were plotted and contrasted with DFB trap catch numbers (Figure 2). There was a 10 degree temperature difference on average from the bottom of the ski hill to the summit of Bald Mountain. Mean high temperatures averaged 60 degrees by the week of May 30, at the lowest elevation traps, but did not reach 60 degrees the week of June 20 at higher elevations.

The DFB trap catches peaked by July 5th and sizeable catches continued through late August. The first beetles were collected the week of May 30, and averaged two per trap (Figure 6). Overall, trap catches dropped by a third the last week of August and catches slowed to an average of 6 DFB per trap by the last collection date of September 24 (Figure 6). When the average weekly temperatures decreased, DFB trap catches decreased as well. For example, the cold and rainy weeks of June 20 and July 4 resulted in fewer beetles trapped. Also, trap catches varied significantly with elevation. For example, the week of June 27 averaged 3000 DFB per trap at the base and on that same collection date, only 12 beetles were trapped on average at the summit where temperatures were still much lower.

DFB flight periodicity varies from one year to another. By comparison, a previous DFB trapping effort conducted near the BSMA by Sawtooth NF and Idaho Department of Lands personnel in 2007 caught an average of 152 beetles per trap by May 19 at 6500 feet elevation when average spring temperatures were higher than in 2010 and 2011. In 2007, the flight period began much earlier even though the number of beetles per trap remained relatively low until June 20, only a week earlier than similar trap catches in

2010 or 2011 (Figure 7). The highest weekly trap catch in 2007 was 6,300 compared to 1,070 in 2010 and 6,200 at a site in 2011 along Warm springs Road (Figure 7). In 2011, the highest overall weekly trap catch averaging all locations was 3,800 DFB on June 27. Even though there were many more DFB caught in 2011 than in 2010, they did not sucessfully attack the standing green trees in the treatment area or in the nearby untreated areas.

Figure 5. Location of Douglas-fir beetle flight monitoring traps and weather stations associated with the Bald Mountain MCH Project, Ketchum Ranger District, 2011, 2010 and 2006.

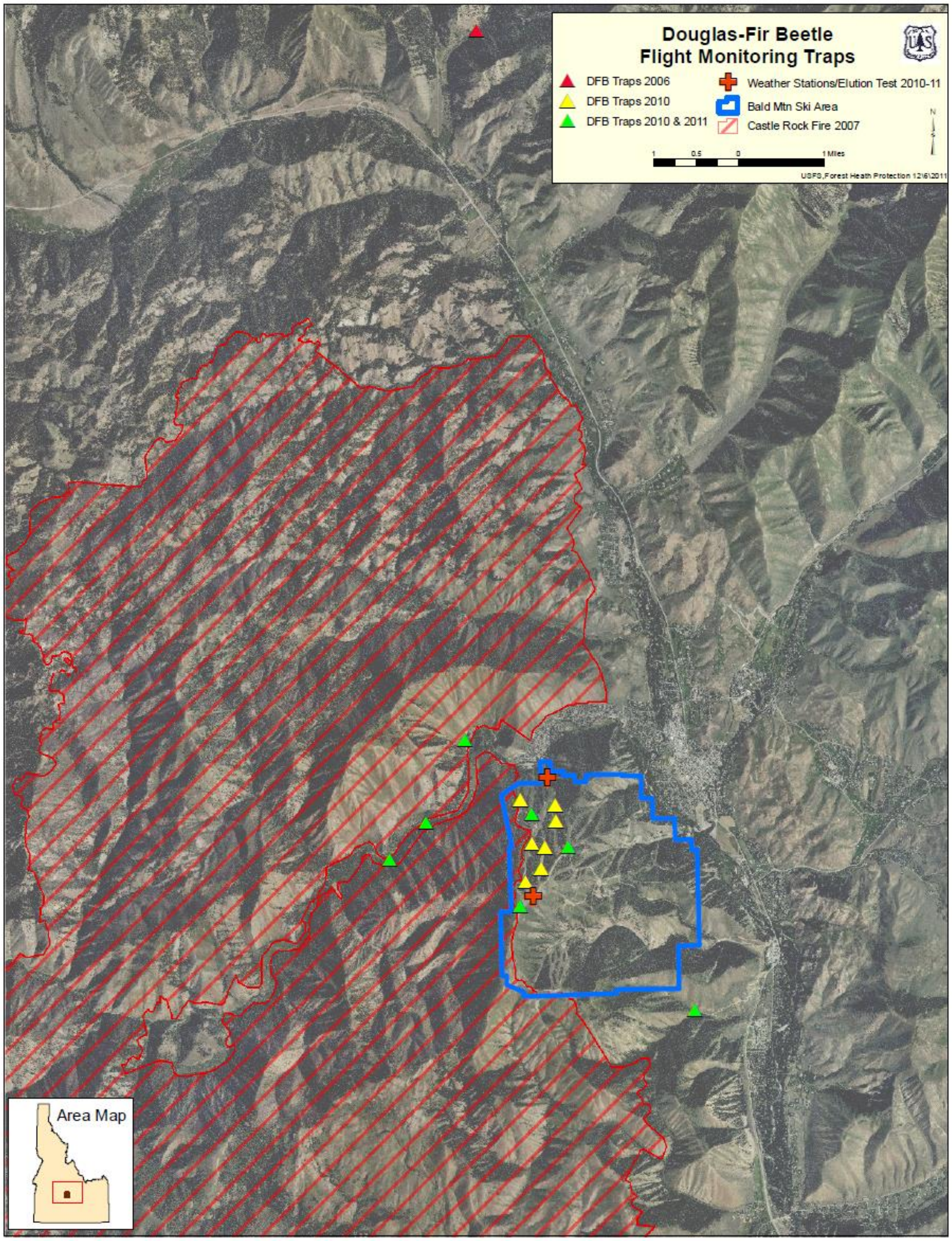


Figure 6. Douglas-fir beetle flight period from May 18 to September 26, 2011 on Bald Mountain Ski Area, Warm Springs Road, and Clear Creek Road, Ketchum Ranger District.

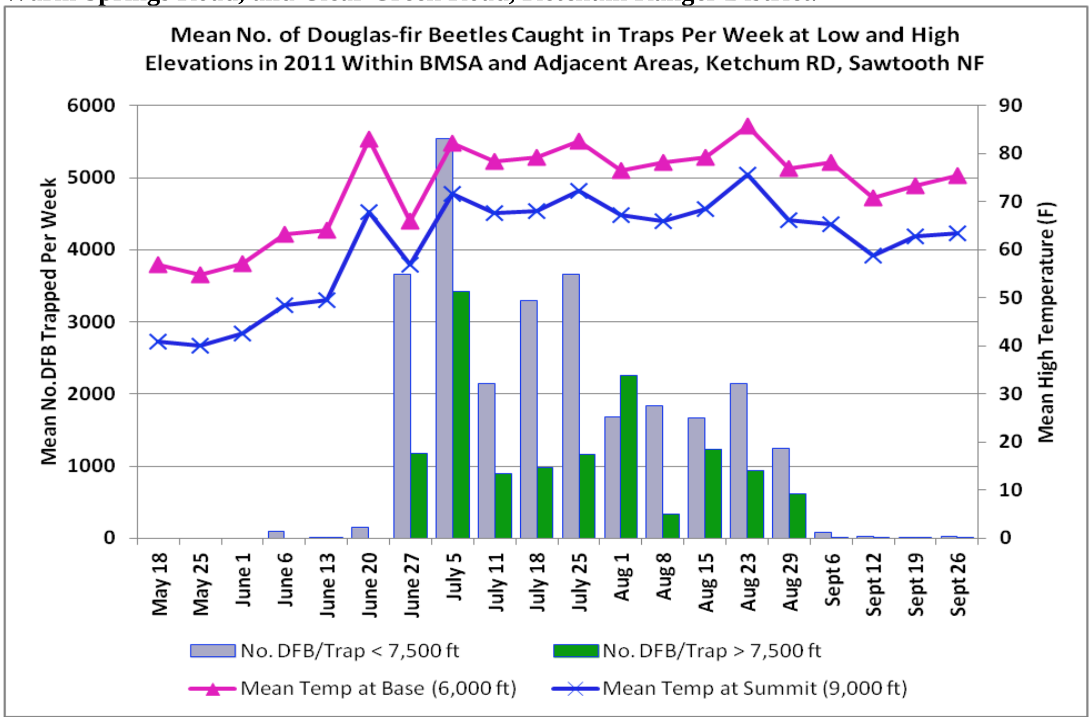
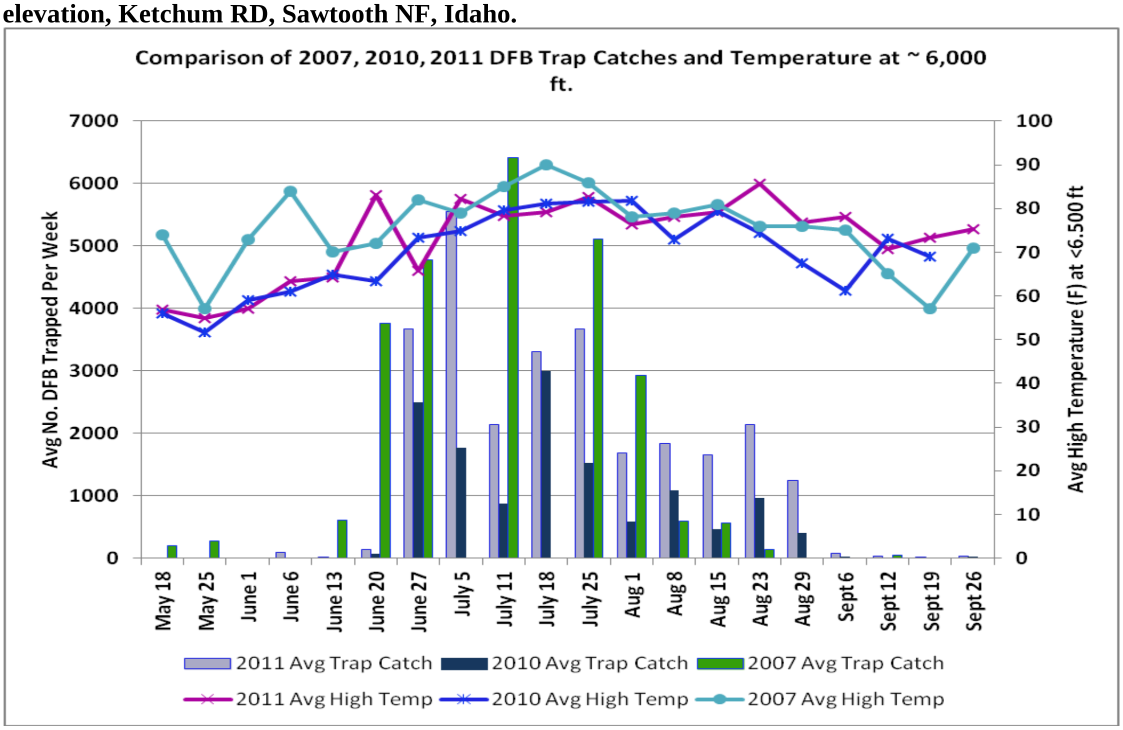


Figure 7. Douglas-fir beetle flight period from May 18 to September 26, 2011 on Bald Mountain Ski Area and adjacent areas in 2006, 2010, and 2011; and, the corresponding average high temperatures at 6,000 ft. elevation, Ketchum RD, Sawtooth NF, Idaho.



MONITORING FLAKES DURING THE APPLICATION

Objectives and Methods. In response to management concerns, potential flake drift was evaluated using AGDISP Drift Model, version 8.23 (Tesk et al. 2010) and a 300-foot no-flake stream buffer was established to protect these areas. As with the 2010 treatments, five monitoring locations were established prior to treatment to determine if the 300-foot riparian buffer area along three waterways (Big Wood River, Clear Creek, and Warm Springs Creek) was adequately protected from the flake application (Figure 9) (Lazarus and Bennett 2010). The difference in 2011 was that reusable 1- meter square PVC frames were placed on the ground at intervals along a transect in steep areas. These frames prevented the flakes from sliding off of the sample sheets as had occurred during the 2010 treatment project. We also monitored flake distribution at three areas of the treated acres the day of application (Figure 8)

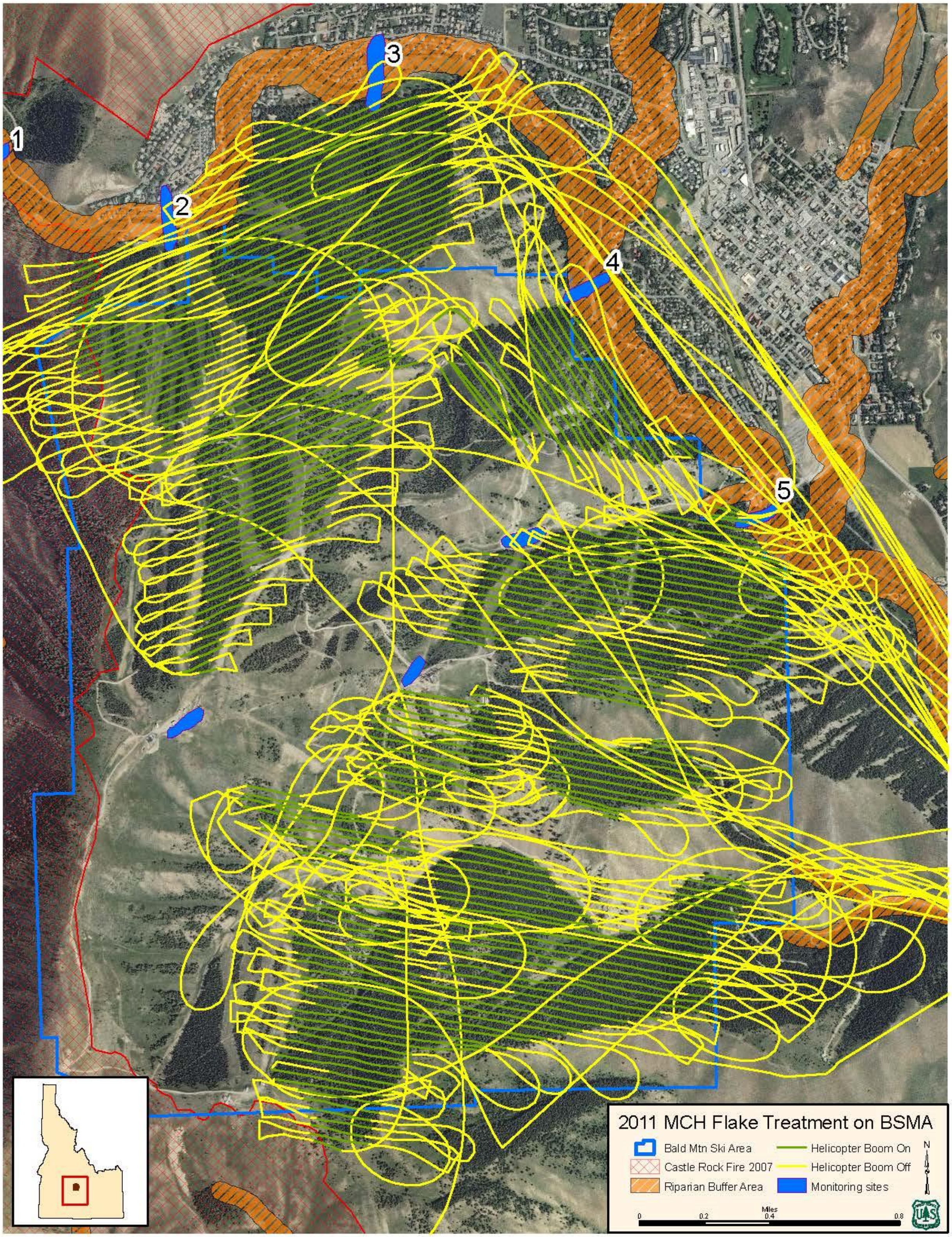
One observer monitored each area during the flake application, shown as a blue polygon in Figure 8. Observers measured and recorded wind speed and wind direction at 15-minute intervals, reporting by radio to the COR when constant wind speeds exceeded 6 mph, or gusts occurred over 10 mph. Observers recorded flakes visibly falling over the monitoring cloths in the buffer area, and counted and recorded the total number of flakes on the monitoring cloth or within each PVC frame sample. Any observed occurrence of flakes in the buffer areas was recorded and reported to the project manager and the Contracting Officer's Representative.

Results and Discussion. The application was determined to be successful because it was completed safely, flakes remained outside of the riparian area, and satlock output showed consistent boom on lines throughout the treatment area. SatLock output was generated during application to show flight lines where the helicopter boom was turned on and off, (Figure 8). Several flakes were found within the buffer area of Location 3, perhaps because flakes were applied to this area last in the day when wind speeds were being reported as frequently gusting (Figure 8). The other riparian monitoring locations were free of flakes. It is very important to only apply flakes when wind gust speeds are below 10 m/h.

Observers were placed in the treatment area to monitor flake dispersal from the helicopter to the ground. Target flake distribution was approximately one flake per square foot. The observers noted flakes landing in their area and walked around the designated area to record flake presence or absence and general distribution. During the application, we were only able to place two observers at the top of Bald Mountain, at the Gondola lift and four in the riparian buffer zones due to snow cover and road access. It was very difficult to find the brown flakes in the treatment area even immediately after application. To find any flakes at all in the treatment area, involved squatting to ground level and sometimes picking through the ground litter.

Lessons Learned: While brown flakes are more appealing from the perspective of public comfort levels, they are very difficult to monitor once they fall to the ground because they blend in remarkably well with debris. If brown flakes are used, it would be best to do all dosage monitoring the day of the application using some sort of removeable sheet or catchment device. However, safe access was the limiting factor in our monitoring efforts on treatment day because of steep, snowy terrain.

Figure 8. **Helicopter flight lines during the aerial application of MCH flakes on BMSA; and, monitoring sites the day of treatment, June 10, 2011.**

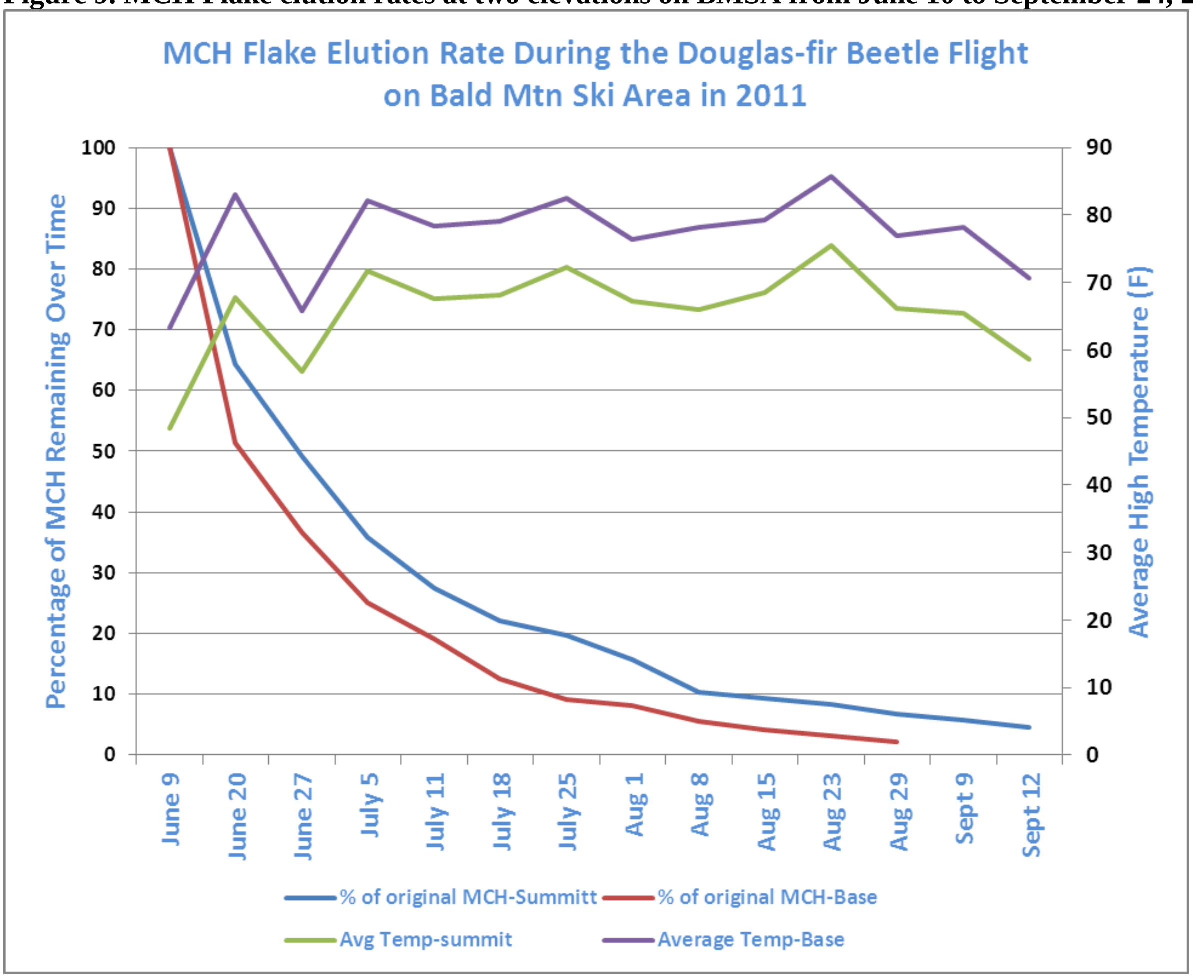


MCH FLAKE ELUTION TEST

Objective and Methods. The objective of the MCH flake elution test was to monitor the release of MCH from the supply of DISRUPT Micro-flake® MCH used in the BMSA operation, in order to ensure that the product performance was reliable throughout the DFB flight period. In the event of a treatment failure, this information might indicate one likely cause. Analytical Labs, Boise, Idaho conducted the elution tests using Hercon Envrionmental, Analytical Method, No. X00128, DISRUPT Micro-flake MCH.

Results and Discussion. The Disrupt MCH flake label states that flakes provide protection for 2 months. Elution test results show adequate protection from application date, June 10, through the beginning of August. Most of the MCH elutes in the first four weeks after application, and then slows. Peak trap catches were June 27 to August 23, so MCH was eluting at a high rate the week of June 20 when DFB began flying in great numbers. Less protection was available through the last part of the peak flight in August, however, DFB flight was much reduced during the month of September making low elution rates less of an issue (Figure 9). It is still unclear how much MCH is needed to elute from the flakes to manipulate DFB behavior. In any case, it is most crucial to repel the DFB early in the season to avoid any attacks and natural aggregation pheromones in the treatment area if the goal is to reduce impacts to DF over the entire season. Lastly, the DFB beetle flight activity was quite high in the treatment area, according to trap catches, but generally 2011 attacks of healthy DF were rare.

Figure 9. MCH Flake elution rates at two elevations on BMSA from June 10 to September 24, 2011.



RECOMMENDATION

There are several things to consider when deciding on a strategy for 2012, including DFB risk of attack, cost of treatment options, acceptable levels of mortality, general locations of acceptable mortality, and safety of personnel during applications. An aerial application of MCH flakes similar to 2011 is not warranted for 2012 because DFB populations are no longer at outbreak levels on BMSA. DFB attacks were largely not observed in 2011, essentially eliminating the breeding population. Similarly, new attacks in 2012 are expected to be less than 2011 levels. This will be the fifth flight season after the fire and DFB outbreaks following fire rarely last longer than 5 years.

Therefore I recommend no MCH treatment on BMSA in 2012. I do, however, recommend beginning the next phase of management on BMSA, by implementing the vegetation management plan. In the future, FHP suppression dollars for use on the ski area will be contingent upon active management efforts to reduce the susceptibility of these acres to DFB by silviculturally altering stand conditions. That said, FHP dollars may be obtained for use in preventative management actions taken to reduce stand susceptibility to DFB, namely, reducing tree density all over BMSA.

ACKNOWLEDGMENTS

Many Thanks to Region 4 FHP staff and fellow entomologists including: Dayle Bennett, Philip Mocettini, Kathleen Matthews, Ken Gibson, Tom Eckberg, Carl Jorgensen, and Chad Nelson for advice and assistance during application day, and assistance with efficacy assessments on BMSA. A special thanks to Terri Johnson for her integral assistance in all phases of this project, including but not limited to, the following: GIS support; application day monitoring and odds and ends; field work including trapping efforts, elution tests and weather station setup; and field work involving strenuous climbs all over this steep (up to 80 percent slopes), rugged mountain to install variable radius plots and record DFB infestation levels.

Thanks to Ketchum District Ranger, Kurt Nelson and District personnel for proactively addressing the issue of DFB-fire related impacts to the DF resource on BMSA. Thanks to Ed DeThomas for collecting DFB from the traps each week, changing lures and collecting flakes for elution testing. Thanks to Jim Rineholt for managing the project budgets, for working with Idaho Department of Lands to provide support to private landowners adjacent to the project area, and for continuing to stress the need for active silvicultural management throughout BMSA. Thanks to Joe Miczulski for acting as liaison between BMSA and FHP during our evaluations and for communicating effectively with media and townspeople during project implementation.

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APPENDIX A. Aerial treatment of MCH flakes and ground deployment of bubble caps on Bald Mountain Ski Area, Ketchum Ranger District: All monitoring transects include ten variable radius plots per transect, 20 BAF, installed in treated and untreated acres September 2010 or 2011.

TRANSECT	YEAR ATTACKED	AVG d.b.h.	DF Residual BA >17" d.b.h.	Total Residual BA	% Plots with Correct 2010 Flake Distribution	TREES PER ACRE (TPA) Attacked		
						2009	2010	2011
TREATED ACRES								
BURNED								
2	2009, 2010	18.3	15	72	100	6.6	1.4	0
14	2009	14.3	17	158	100	1.9	0	0
SUBTOTALS		***16.3***	***75***	***115***	***100***	***4.2***	***0.7***	***0***
UNBURNED								
1	2009,2010	17.2	14.8	72	50	17.2	12.2	0
3	None	20.4	200	265	100	0	0	0
5	2009	14.3	35	140	100	2.5	0	0
4	None	9.2	8	88	100	0	0	0
6	None	18.5	72	152	100	0	0	0
7	None	21.7	164	208		0	0	0
8	None	19.2	188	320	70	0	0	0
9	None	13.2	32	212		0	0	0
10	2009, 2010, 2011	21.7	120	260	100	4.0	4.0	1
15	2009	14.5	38	144	75	5.8	0	0
16*	2009, 2010	16.4	28	60	70	20.4	1.2	0
17*	None	25.9	124	128	100	0	0	0
18	None	18.6	48	168	100	0	0	0
20	2010	11.9	12	174	90	0	12.6	0
22	None	10.9	0	22	60	0	0	0
23	2009, 2010	12.7	10.5	191	50	3.7	12.1	0
28	2010, 2011	11.0	4	216	10	0	40.1	1
29	None	16.1	52	247	0	0	0	0
30	2009	14.3	35.5	200	0	2.5	0	0
31	2009	14.2	- --	---	54	10.1	0	0
32	None	19.0	80	122	30	0	0	0

TRANSECT	YEAR ATTACKED	AVG d.b.h.	DF Residual BA >17" d.b.h.	Total Residual BA	% Plots with Correct 2010 Flake Distribution	TREES PER ACRE (TPA) Attacked		
						2009	2010	2011
34, 35, 36 *	2009, 2010	23.8	143	173	----	13.4	6.4	0
37	2009	16.0	102	130	----	0.92	0	0
38	none	12.3	36	178	----	0	0	0
39*	2009, 2010	22.9	40	97	----	0.7	7	0
40,41	2009, 2010	---	---	---	----	---	---	0
42*	none	19.7	86	104	----	0	0	0
43*	none	7.7	62	92	----	0	0	0
45*	none	21.4	116	14	----	0	0	0
SUBTOTALS		***14.5***	***57.8***	***139.2***		***2.8***	***4.3***	***0***
TOTALS TRT		***15.4***	***66.4***	***127.1***		***3.5***	***3.2***	***0.03***
UNTREATED ACRES								
BURNED								
11	2009, 2010	18.8	42	70	100	16.5	23.9	0
12	2009, 2010	18.5	0	58	10	7.5	3.0	0
13	2009, 2010	20.2	66	114	90	4.6	22.8	0
26	2010	17.4	98	190	100	0	3.6	0
27	2009, 2010	23.7	48	50	50	0.69	0.6	1
44	2009, 2010, 2011	12.6	65	170	----	3.4	0.7	8.5
SUBTOTALS		***18.5***	***53.2***	***108.7***		***5.4***	***9.1***	***1.6***
UNBURNED								
25	2010	20.6	71	120	100	0	7	0
24	None	19.0	80	122	30	0	0	0
33	2010	16.3	74	192	100	0	39.9	0
SUBTOTALS		***18.6***	**75**	**145**		***0***	***15.6***	***0***
TOTALS UNTRT		***18.5***	***64.1***	***126.8***		***2.7***	***12.3***	***0.8***

*****MCH Bubble Caps were deployed in these areas instead of MCH flakes.
BA = ft^2 of basal area/acre

APPENDIX B. In September, 2011, additional areas within the 2007 CastleRock Fire boundary and/or within 5 miles of BMSA. Monitoring transects include ten variable radius plots, 20 BAF and analyzed using FINDITS. Plot 1 of transect was placed in a DFB pocket, additional plots were spaced at least three chains apart through the stand.

Transect	Year Attacked	AVG d.b.h.	DF Residual BA >17" d.b.h.	Total Residual BA	% TPA Host Attacked	TREES PER ACRE (TPA) Attacked		
						2009	2010	2011
46*	2009,2010,2011	14.3	22	144	15.2	16.6	2.6	5.0
47	2009,2010,2011	17.5	34	105	16.2	7.2	7.5	14.3
48*	2009,2010,2011	13.6	11	76	26.5	31.6	19.3	9.0
49	2009,2010,2011	16.6	28	60	27.5	10.9	13.8	6.0
50*	2009,2010,2011	16.9	70	157	3.5	2.4	1	2.0
TOTALS		***15.8***	***33***	***108***	***18.6***	**26.9**	***8.8***	***7.3***

*****Areas burned by CastleRock Fire in 2007.